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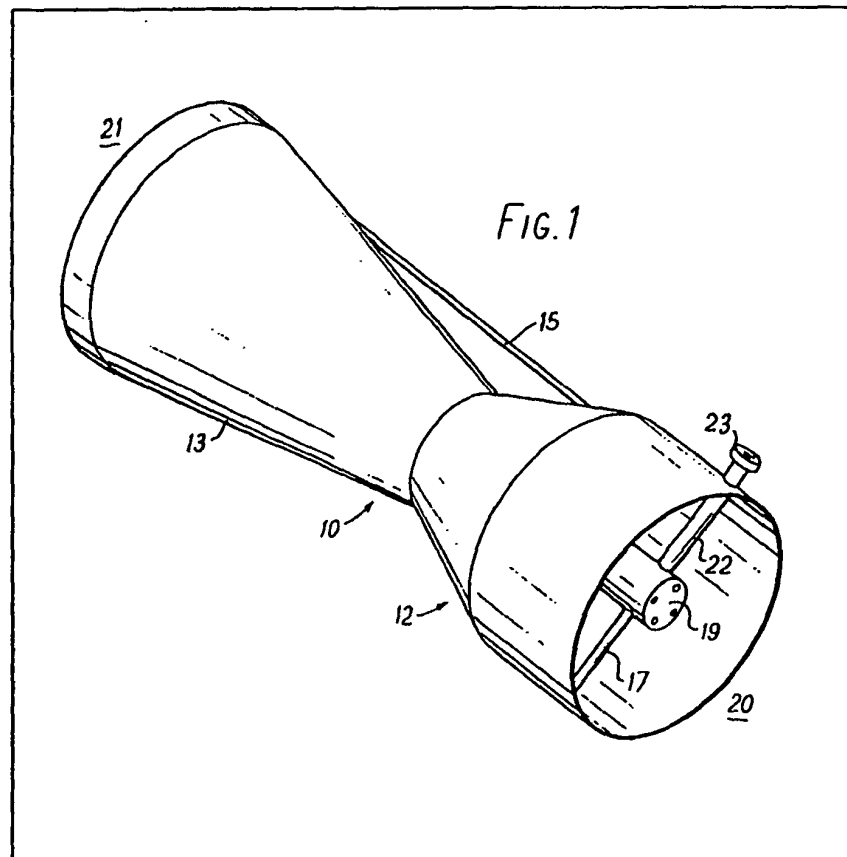
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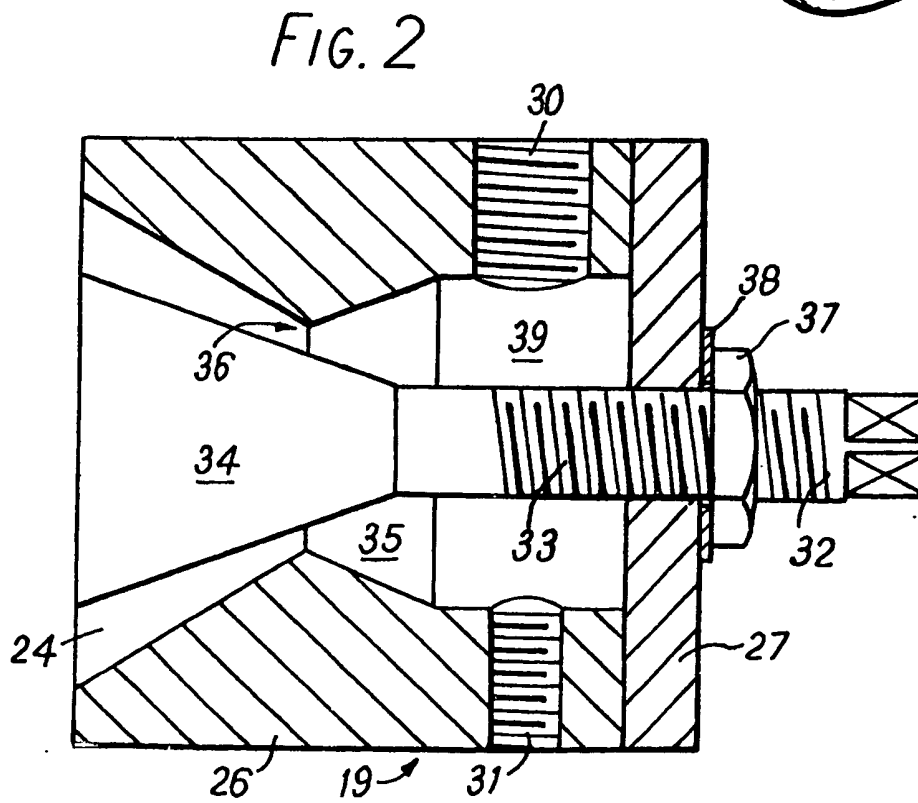
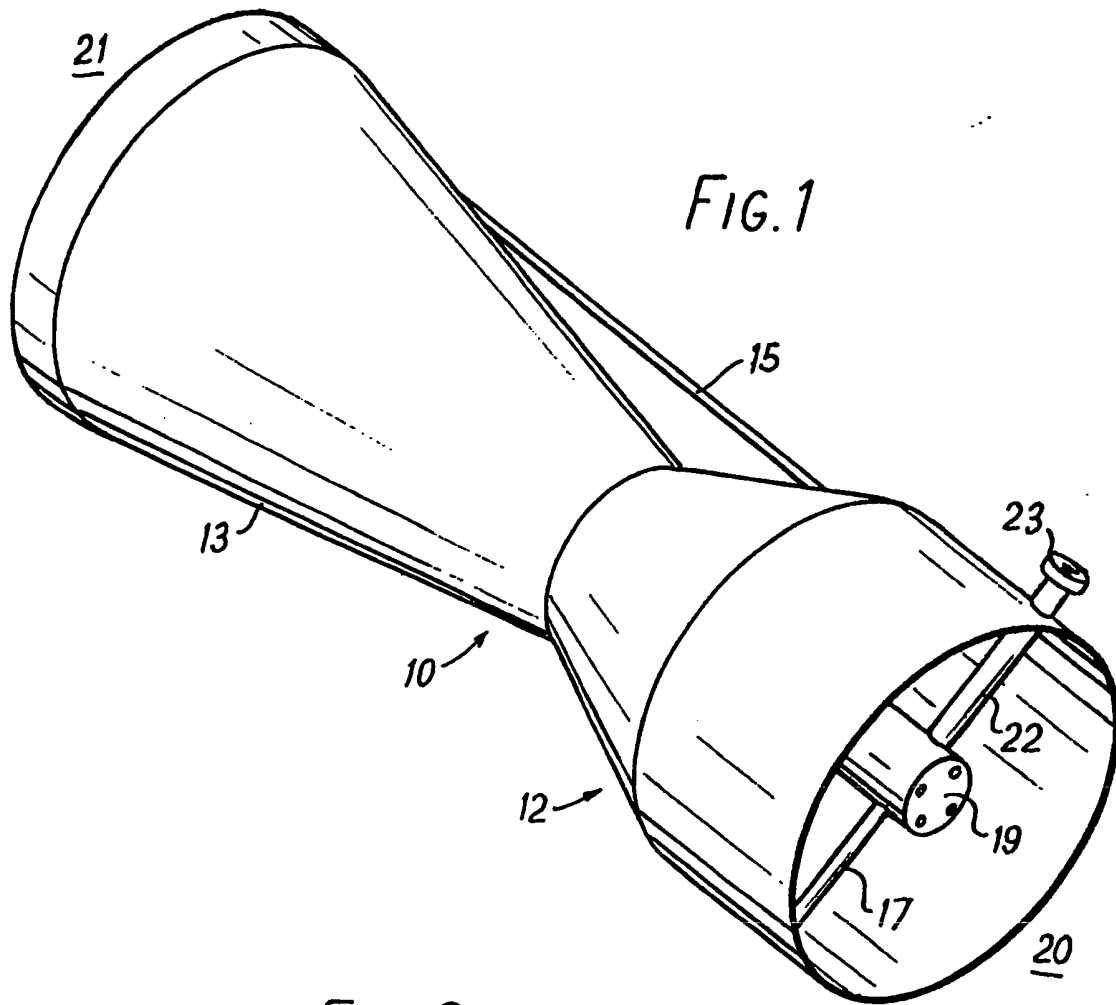
(54) Assisted gas flow device

(57) An assisted gas flow device comprising an elongate duct 13 with an internal venturi profile, and at one end of the duct a nozzle 19 for introducing gas under pressure whereby to create a movement of

ambient gas in the duct and a pressure change from the flow of such gas through the venturi, which flow encourages or promotes an overall flow of gas through the venturi from one end thereof to the opposite end. An adjustable tapered needle may be positioned in the nozzle 19.



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SPECIFICATION

Assisted gas flow device

This invention relates to an assisted or forced gas flow device and is particularly, but not exclusively, concerned with a gas extractor. An important practical application for embodiments of the invention is as a fume-laden air extractor for forced extraction from confined spaces or enclosures where noxious fumes may accumulate, which fumes may thereby be extracted with the ambient air.

Known air extractors are typically of the mechanical displacement type, in particular employing conventional rotating fan blades, typically driven by a motor powered from some available external source, such as electricity or even compressed air. However, such fans are not always particularly efficient for fume extraction, especially when a large enclosure with a relatively high concentration of fumes is to be vented and the drive motor may be a fire hazard unless 'spark shielded'.

According to the invention an assisted gas flow device comprises an elongate duct with an internal venturi profile and at one end of the duct a nozzle for introducing gas under pressure, whereby to create a movement of ambient gas in the duct and a pressure change from the flow of such gas through the venturi, which flow encourages or promotes an overall flow of gas through the venturi from one end thereof to the opposite end.

Conveniently, compressed air is fed to said nozzle and is exhausted therethrough into the duct interior and directed towards said internal venturi profile.

Desirably, the nozzle itself comprises a subsidiary venturi device in which a centre tapered jet orifice incorporates a tapered needle of position axially adjustable with respect to the jet mouth or nozzle, said auxiliary venturi being axially aligned with the primary internal venturi of the duct.

Air or other gas under pressure may be introduced into a plenum or jet chamber adjacent to said jet venturi and in the region of the jet needle body for emergence between the jet nozzle mouth or orifice and the outwardly flaring or tapered jet profile of the jet needle.

Such an assisted or forced gas flow device has been found to be very efficient in gas extraction, particularly fume-laden air from enclosed chambers, yet involves no moving parts and thus is relatively maintenance-free.

There now follows a description of a particular embodiment of the invention, by way of example only, with reference to the accompanying drawings, in which:

Figure 1 shows a general perspective view of a forced or assisted gas flow device according to the invention, in the form of an air/fume extractor; and

Figure 2 shows a sectional view of an auxiliary venturi or jet nozzle device used in the device shown in Figure 1.

Referring to the drawings, a forced or assisted gas flow device comprises an air/fume extractor in the form of an elongate prefabricated duct 10 with an internal combined or twin taper imparting a V-shaped profile defining an internal venturi or restriction in the elongate flow passage or duct formed thereby.

In this case, as the construction is of sheet metal material, the external profile of the duct reflects the internal venturi profile as will be apparent from Figure 1. A bracing strut 15 is provided between the two tapered parts of the duct 10 and this may also be used for mounting the duct 10 at a desired location in a region into which or from which gas, in particular air/fume mixture, is to be forced. Thus the device can be used either as a forced extraction device for extracting air from a region or as a forced intake device for forcing air or other gas into a region.

The duct 10 is of characteristic venturi non-symmetrical section and at one end tapers more acutely over a given length than the other and the shorter stubbier region 12 forms an intake end, whereas the longer region 13 forms an exhaust end 21. Each end is provided with a peripheral cylindrical flange for connection to a proprietary ducting, for example 12" diameter flexible ducting.

At the intake end there is provided a nozzle assembly 19 shown in more detail in Figure 2, and which is mounted by a diametrical arm comprising a radial support strut 17 and an aligned radial supply pipe 22, for coupling through a flange 23 to an air hose connecting with an air supply (not shown).

Compressed air, for example at a pressure of between 4 to 12 bar, is applied through the pipe 22 to the nozzle assembly 19 and emerges through a jet formed therein, as described later, and into the interior of the intake region 12 of the duct.

Referring to Figure 2, the jet nozzle comprises a cylindrical body 26 with an internal taper profiled aperture 24 therethrough, closed at one end by a support plate 27 for an axially adjustable jet needle 32. The latter incorporates a generally cylindrical portion externally threaded along part of its length 33 at one end and an outwardly tapering head portion 34, generally aligned with a restriction or inward tapering region 35 of the through aperture 24 in the block 26. The tapered jet needle 32 and aperture 24 together form an annular jet orifice 36 whose annular peripheral thickness or depth is adjustable by axial movement of the jet 32, using a lock nut 37 threaded onto the external threads of the cylindrical portion 33 thereof. The lock nut 37 bears against a locking washer 38 abutting the support plate 27 and the jet 32 is rotatable or axially sitable by means of machine flats on the end thereof.

The block 26 is formed with diametrically opposed radial bores 30 and 31 for respectively receiving the supply pipe 22 and the strut 27, both shown in Figure 1. The supply pipe 22 will thereby communicate with a generally cylindrical region

39 around the jet 32 and communicating with the tapered region 35 and the jet orifice 36 defined between the jet 32, or rather the outwardly flaring or tapered region 34 thereof, and the maximum inward extent of the taper or restriction on the aperture in the block 26.

It will be appreciated that high pressure air entering through the pipe 22 into the jet region 39 will be forced to escape through the relatively restricted annular jet orifice 36 and will thereby flow at high speed therefrom with an attendant pressure drop. High speed air emerging from the nozzle assembly 19 is introduced into the intake end 12 of the duct 10 and draws ambient air with it, by frictional interaction therewith, through the primary internal cross-sectional venturi construction in the duct body, from the intake end 12 to the exhaust end 13, and as a result there is an attendant general pressure drop thereacross promoting the air flow through the duct.

Any noxious fumes or other gases present in the ambient air will be drawn into the intake end 20 through the tapered duct 10 and will be exhausted from the exhaust end 21.

The same principle can of course be used to introduce air into a region by connecting the outlet end 21 to the region and the intake or inlet end 20 to another region containing the input gas.

The nozzle assembly is desirably fabricated of stainless steel and is, using the adjustable jet nozzle 19, adjustable to different air supply pressures to create the internal air flow and pressure drop.

The primary duct assembly 10 is desirably fabricated from 18 gauge mild steel sheet material, galvanised after production.

The support strut 17 and indeed the supply duct 23 may be fabricated of proprietary tubing, conveniently $\frac{1}{2}$ " pipe, blanked off, for example by an end plate.

The invention finds particular application as an exhaust or forced air/fume ventilation device for use in enclosed working environments where noxious fumes may be generated, for example in the holds or containers within ships where gas cutting or welding operations may be carried out.

More generally the invention may be used safely to ventilate fumes from storage tanks for liquid which may give off noxious or volatile fumes, whether in road tankers, on board ships or on fixed oil storage installations on land.

It will further be appreciated that the absence

of moving parts in the device according to the invention makes servicing or maintaining virtually negligible and provides a high level of in-service reliability.

The capacity or forced flow rate capability of the device may be adapted according to the pressure of driving compressed air or other gas available and the overall dimensions and proportions of the duct itself and the gas movement generating nozzle therein.

The invention is particularly suitable for occasional use in situations where a high throughput demand is required, but may also be adapted for continuous running over long periods where an appropriate supply of compressed air or other gas is available. In this respect the invention is particularly suitable for the venting of shipboard oil tanks prior to inspection.

CLAIMS

1. An assisted gas flow device comprising an elongate duct with an internal venturi profile and at one end of the duct a nozzle for introducing gas under pressure, whereby to create a movement of ambient gas in the duct and a pressure change from the flow of such gas through the venturi, which flow encourages or promotes an overall flow of gas through the venturi from one end thereof to the opposite end.

2. An assisted gas flow device, as claimed in Claim 1, wherein compressed air is fed to said nozzle and is exhausted therethrough into the duct interior and directed towards said internal venturi profile.

3. An assisted gas flow device, as claimed in Claim 1 or Claim 2, wherein the nozzle itself comprises a subsidiary venturi device in which a centre tapered jet orifice incorporates a tapered needle of position axially adjustable with respect to the jet mouth or nozzle, said auxiliary venturi being axially aligned with the primary internal venturi of the duct.

4. An assisted gas flow device, as claimed in Claim 3, wherein air or other gas under pressure is introduced into a plenum or jet chamber adjacent to said jet venturi and in the region of the jet needle body for emergence between the jet nozzle mouth or orifice and the outwardly flaring or tapered jet profile of the jet needle.

5. An assisted gas flow device, substantially as hereinbefore described with reference to and as shown in the accompanying drawings.